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(54) Syphonic rainwater outlet

(57) The outlet 10 enables syphonic action to be induced substantially independently of the layout of the pipework to which it is connected. The outlet comprises an upwardly extending inlet passage 36 above whose lower end a head of water can accumulate. A syphonic discharge passage 18 extends downwardly from the upper end of the inlet passage 36. A sump 16 may be used to accumulate the head of water. The inlet passage 36 may be defined between the upper end of the passage 18 and an inverted cup-shaped member 36. Weep holes 24 may extend between the base of the sump 16 and the discharge duct 18.

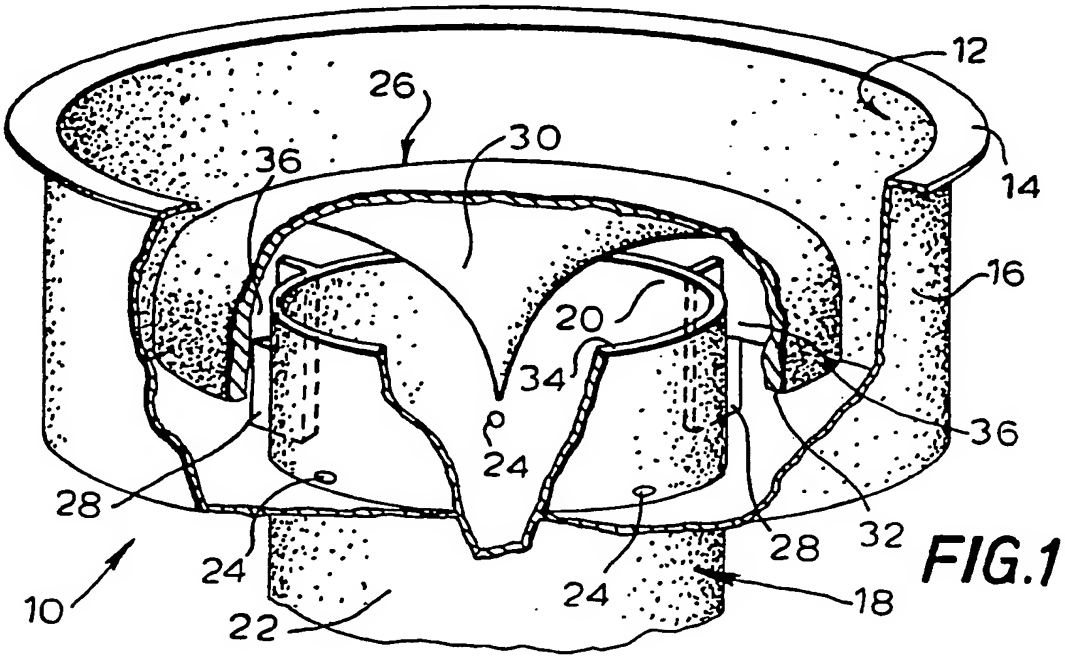

FIG.1

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At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

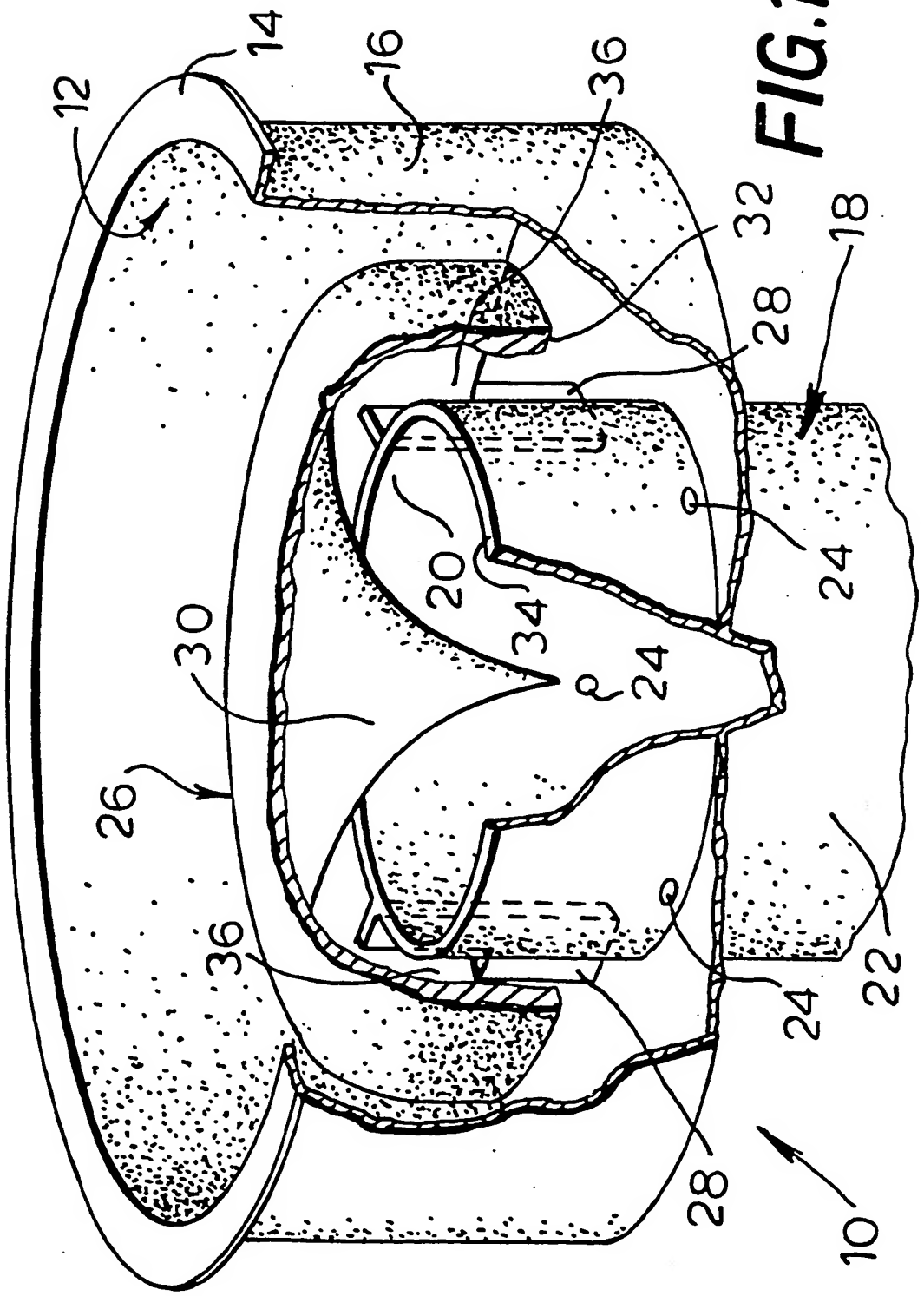

FIG.1

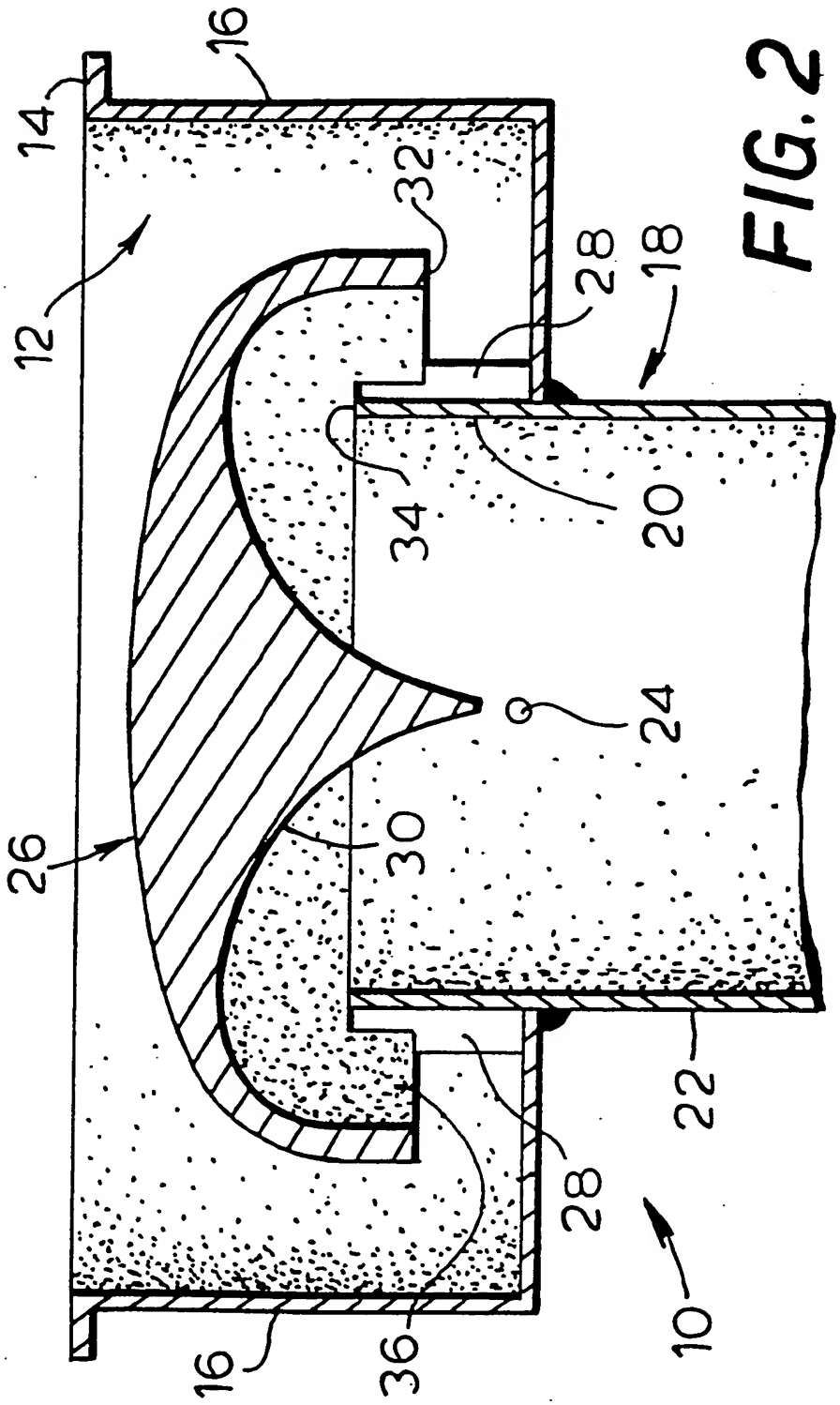

FIG. 2

Syphonic Rainwater Outlet

This invention relates to drainage fittings for incorporation into buildings, roads, paved areas or the like and more particularly to fittings known as rainwater outlets, used to lead water from flat roofs, roof gullies or guttering into an associated pipework system.

Drainage systems for the above applications can be divided into two main categories: so-called gravity systems which operate substantially entirely at atmospheric pressure, and syphonic systems. Gravity systems are relatively easy to install and are reliable in operation, given adequate pipe sizing and that layout constraints permit an absence of uphill flow. In comparison to syphonic systems, larger bore pipes are required as, due to air entrainment, even at maximum capacity the system will be only about one-third full of water. Syphonic systems on the other hand can operate up to 90% or more full of water and can therefore employ smaller bore pipes.

Hitherto in syphonic systems, the design and layout of the pipework has been used to induce the syphonic action in use, that is, to prime the system. Such syphonic systems are complex and need to be carefully designed and installed in order to ensure that suction is properly induced and maintained.

The present invention aims to provide a rainwater outlet which enables syphonic action to be induced substantially independently of the layout of the pipework to which the outlet is connected. In accordance with the invention a syphonic rainwater outlet comprises an upwardly extending inlet passage and a syphonic discharge passage extending downwardly from an upper end of the inlet passage. Such an outlet can itself induce syphonic action by creating a

continuous water column in the syphonic discharge passage. The induced syphonic action ensures that the outlet will handle much higher flow rates than a conventional outlet of comparable size. The outlet can also be fitted to existing pipework to induce greater flow and thereby enhance performance. If a sealed connection is made between the outlet and the pipework, at higher flow rates the water column can extend into the pipework thus providing increased suction.

Preferably the outlet comprises a sump arranged to accumulate a head of water in use, the water entering the inlet passage from the sump. The sump may surround the syphonic discharge passage, so producing an outlet of particularly compact form. The syphonic discharge passage may comprise a pipe having an upper end upstanding from the base of the sump and covered by an inverted cup-shaped member to form the inlet passage.

One or more drainage ducts may extend horizontally or downwardly from the sump to communicate with the syphonic discharge passage. These ducts ensure that at low flow rates the sump empties, so preventing blockage of the outlet by ice in cold weather. The flow capacity of the drainage ducts is made sufficiently low so that they do not interfere with the syphonic action of the outlet at higher flow rates.

An illustrative embodiment of a rainwater outlet according to the invention is described below with reference to the drawings in which:-

Figure 1 is a diagrammatic perspective view of the rainwater outlet, shown partially broken away to reveal its internal structure; and

Figure 2 is a cross-sectional view of the outlet of Figure 1.

The outlet 10 comprises a sump body 12 having a peripheral lip 14 which may be sealed to a surrounding flat roof surface or roof gully base for example by a clamping ring of well known type. Alternatively the rim 14 may be sealed about an aperture formed in the base of a rainwater gutter, or a gutter section (not shown) may be integrally formed above the sump in place of the rim 14 for connection with lengths of guttering on either side. The side walls 16 of the sump 12 may be outwardly flared or radiused at their upper edge (not shown) over all or part of the sump circumference, in order to reduce flow turbulence.

At the centre of the outlet 10 there is provided a syphonic discharge passage 18 comprising a pipe having a section 20 extending upwardly into the sump 12 and a section 22 (only partly shown) forming a spigot which may be of any convenient length for connection to an associated pipework system. Drainage ducts or weep holes 24 are formed substantially horizontally through the wall of discharge passage 18 at its junction with the base of the sump 12.

The upper section 20 of the discharge passage 18 is surmounted by a cap 26 of inverted cup shape supported on three radial fins 28 (only two shown) formed in the corner between the upper section 10 of the discharge passage 18 and the base of the sump 12. The under surface 30 of the cap 26 is vaulted and the rims 32, 34 of the cap 26 and discharge passage 18 respectively may be rounded and enlarged (not shown) to reduce flow turbulence.

The rim 32 of the cap 26 and the upper end 20 of the discharge passage 18 thus define between them an inlet passage 36 extending upwardly from the sump to the upper rim 34 of the discharge passage 18.

Hitherto, syphonic action has conventionally been induced in drainage systems by establishing a falling column of water

in the pipework which generates suction from below the outlet, in much the same way as that when syphoning petrol from a car, suction is initially applied to the lower end of the syphon tube. In contrast, the syphonic rainwater outlet of the present invention operates in a manner more analogous to a w.c. pan, where a head of water released from the cistern accumulates in the pan until a syphon is established through the pan outlet and associated pipework, which evacuates the pan contents.

In the case of the present invention, a head of water accumulates in the sump or other space surrounding the inlet passage, until a syphon is established through the inlet and discharge passages, resulting in strong suction and enhanced flow through the outlet.

Tests using an outlet as shown in the drawing and having a discharge passage internal diameter of 47 mm produced a flow rate of approximately 3 l/S with a 35 mm head of water in the sump. It is preferred that the flow cross-section should not widen in the downstream direction, i.e. the flow cross-section between the cap rim 32 and (i) the sump wall 16, (ii) the sump floor and (iii) the discharge passage upper end 20 respectively, as well as the flow cross-section between the rim 34 and the cap underside 30 and the flow cross-section of the discharge passage 18 should at least all be substantially equal. Even better results are obtained if the flow cross-section progressively narrows in the downstream direction through the outlet.

In the illustrated embodiment, when flow into the sump ceases and water stops flowing over the rim 34, any water remaining in the sump can drain out through the weep holes 24. However, drainage through the weep holes 24 is not so great as to interfere with the induction of syphonic flow once a sufficient head of water has accumulated in the sump 12.

CLAIMS

1. A syphonic rainwater outlet comprising an upwardly extending inlet passage and a syphonic discharge passage extending downwardly from an upper end of the inlet passage.

2. A syphonic rainwater outlet as claimed in claim 1 comprising a sump arranged to accumulate a head of water in use, the water entering the inlet passage from the sump.

3. A syphonic rainwater outlet as claimed in claim 2, wherein the sump surrounds the syphonic discharge passage.

4. A syphonic rainwater outlet as claimed in claim 3 wherein the syphonic discharge passage comprises a pipe having an upper end upstanding from the base of the sump and covered by an inverted cup-shaped member to form the inlet passage.

5. A syphonic rainwater outlet as claimed in any of claims 2-4, comprising a drainage duct extending horizontally or downwardly from the sump and communicating with the syphonic discharge passage.

6. A syphonic rainwater outlet as claimed in any preceding claim wherein the flow cross-section progressively narrows in the downstream direction through the outlet.

7. A syphonic rainwater outlet substantially as described with reference to or as shown in the drawings.

Patents Act 1977 Examiner's report to the Comptroller under Section 17 (The Search report)	Application number GB 9325528.9
Relevant Technical Fields (i) UK Cl (Ed.M) E1C (C18) (ii) Int Cl (Ed.5) E04D 13/04	Search Examiner D HAWORTH Date of completion of Search 15 MARCH 1994
Databases (see below) (i) UK Patent Office collections of GB, EP, WO and US patent specifications. (ii) ONLINE DATABASE : WPI	Documents considered relevant following a search in respect of Claims :- 1-7

Categories of documents

X:	Document indicating lack of novelty or of inventive step	P:	Document published on or after the declared priority date but before the filing date of the present application
Y:	Document indicating lack of inventive step if combined with one or more other documents of the same category	E:	Patent document published on or after, but with priority date earlier than, the filing date of the present application.
A:	Document indicating technological background and/or state of the art	&:	Member of the same patent family, corresponding document

Category	Identity of document and relevant passages	Relevant to claim(s)
X	US 4171709 A (LOFTIN) - see Figure 5	1-3

Databases:The UK Patent Office database comprises classified collections of GB, EP, WO and US patent specifications as outlined periodically in the Official Journal (Patents). The on-line databases considered for search are also listed periodically in the Official Journal (Patents)